February Program Highlights

NASA ASSETS AID CROP INSURANCE DECISION SUPPORT SYSTEM

PI: Greg Koeln, Ph.D., MDA ISI President, Gaithersburg, MD

Highlight: NASA assets, representing averaged monthly values of 12 variables derived by NASA Ames Ecological Forecasting, were used to predict yields for corn, soybean and winter wheat for the U.S. area. Yields prediction was done utilizing Classification and Regression Tree (CART) based on historic yields and NASA data. Historic data (NASA AMES gridded weather data since 1980 and MODIS based data starting 2000) were used to create training data for CART and made possible prediction for the upcoming yield seasons. Hedging and Mapping Tools were developed and incorporated to Insurance Vision web site. Predicted yields and their comparison to historic data (NASA assets) were used for supporting crop insurance decisions.

Relevance: By incorporating NASA assets into the Mapping Tool: http://www.earthsat.com/projects/NasaRoses/MappingTool.htm , allowed users to gain access to valuable information for making insurance decisions based on comparisons to previous years' weather, vegetation indices and yield data. Users buy Insurance through the United State Department of Agriculture (USDA) Risk Management Agency (RMA) where they pay a premium to protect themselves from lower than anticipated yields.

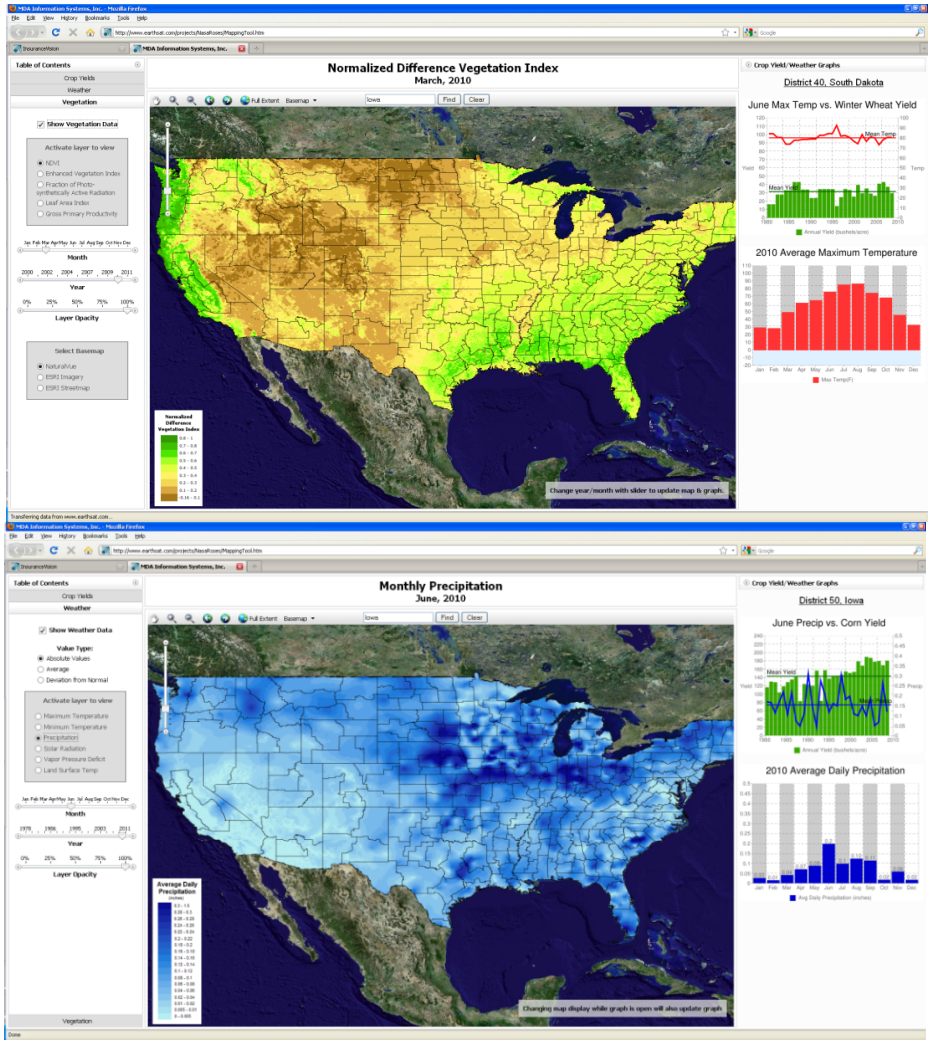

Figure 1: Mapping Tool assisting in making crop insurance decisions based on the NASA assets. The user can analyze maps created from NASA assets and graphs, which represent summarized weather data going back to 1980 on state, crop reporting district and county levels.

ESD Applied Sciences Program

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Forrest Melton, Research Scientist, NASA Ames Research Center & University Crop. Monterey

Project Summary:

The intent is to increase the use of crop insurance and other risk management techniques, as a financial safety net for agricultural producers, by improving estimated crop yields (through the use of NASA Earth science data - and, weather and climate) that are needed in decision support systems for managing crop insurance and hedging tools.

Earth Science Products:

NASA Ames Ecological Forecasting Lab data in 8-km grid:

- Monthly data based on MODIS 8-day composites: FPAR, LAI, NDVI, EVI, LST
- TOPS – BioGeochemical Cycles (BGC) products: Gross Primary Productivity, Soil Moisture
- TOPS – Monthly gridded meteorological surfaces: MAXT, MINT, PRCP, VPD, Incident Solar Radiation

Technical Description of the Images:

Figure 1: The images show distribution of weather features, soil moisture, GPP, land surface temperature and vegetation indices in 8-km grid.

Application to Decision Making:

Prediction was made based on MacDonald Dettwiler and Associates (MDA) EarthSat Weather group Cropcast model, utilizing Crop Condition Index posted on USDA National Agriculture Statistics Service (NASS) website. NASA assets and Cropcast model based predicted yields were incorporated to a Mapping Tool, which allows users to compare historic data (yields, weather, vegetation indices) with current ones and help producers make more informed marketing decisions. These tools – Hedging and Mapping – were tested by AgriLogic partner at commodity meetings.

Scientific Heritage:

The project was enabled through the use of NASA Ames Ecological Forecasting Lab's Terrestrial Observation and Prediction System (TOPS), a data and modeling software system.

References:

Commodity Classic. (2011). Survey Results. Retrieved 4 5, 2011, from Commodity Classic: http://commodityclassic.com/2012/Survey/index.asp

Improved Lake Level Products with Integration of ENVISAT and NASA Data products

Charon Birkett, ESSIC/UMD

Highlight:

A 5X factor improvement was seen in the number of lakes and reservoirs that can be monitored on-line, when the combination of European Space Agency's (ESA) European Remote Sensing Satellite (ERS) data and ENIVSAT, with NASA Ocean Altimetry data was added to the Decision Support System (DSS). While the NASA products have a 10-day temporal resolution, the ESA ENVISAT products are monthly observations of surface water level with a much finer spatial resolution. This improvement will be beneficial to crop analysts and other end users.

Relevance:

Not only will this information improve the geographical distribution of surface water level observations across all continents, but it will allow observation of irrigation potential in many drought prone regions. Since new ENVISAT products will continue to be delivered to the Global Reservoir and Lake Monitor, USDA/FAS crop analysts and other end-users will ultimately be able to monitor several hundred lakes around the world.

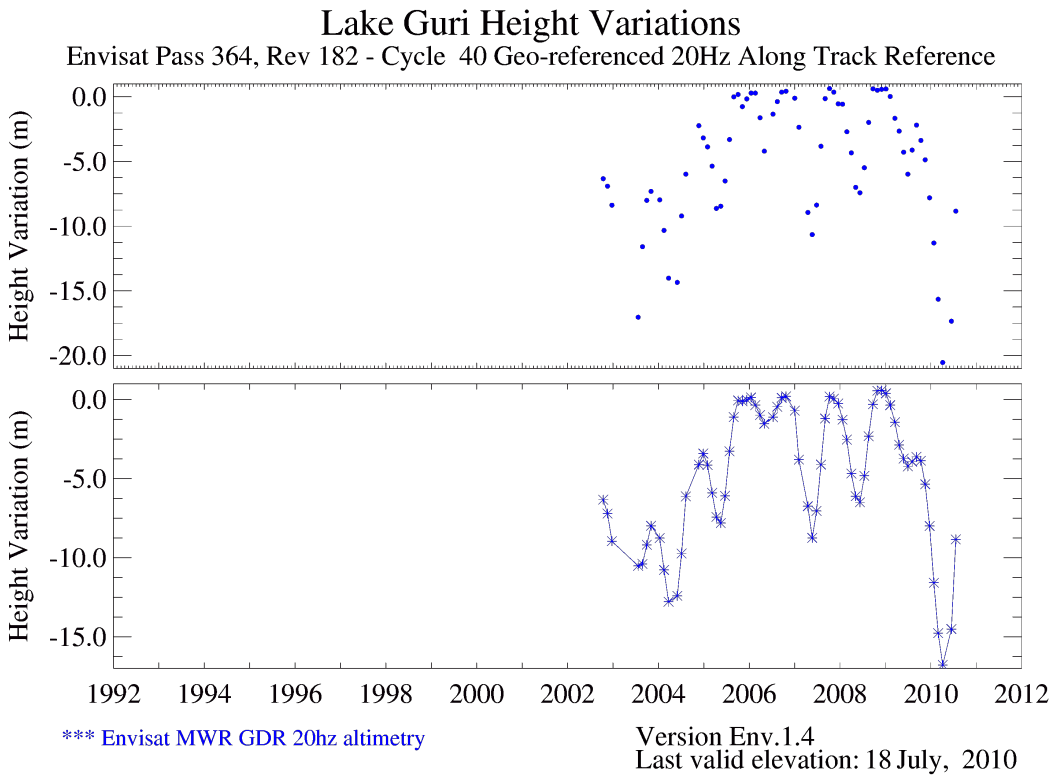

Figure 1 Lake level variations as monitored by the ESA ENVISAT mission between 2002-2010 for Lake Guri, Venezuela noting the decline in water levels (with associated concerns for hydroelectric power) due to drought in 2010. Top plot (raw results), bottom plot (smoothed results).

Additional archive products from the ESA ERS missions will be merged with the above to provide a 1994-2011 time line.

Near real time products will continue with data from the ISRO/CNES SARAL and ESA Sentinel-3 missions (post 2012 and 2013 respectively).

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Project Summary: To incorporate global lake level information within the United States Department of Agriculture (USDC)/Foreign Agricultural Service (FAS) Decision Support System (DSS) to highlight long-term drought and high-water status, for water resources and irrigation potential considerations.

Earth Science Products: Lake level products are derived from techniques relating to satellite radar altimetry. Current altimeter data sets employed are from the the NASA/CNES Topex/Poseidon, Jason-1, and Jason-2/OSTM missions, the US Naval Research Lab's GFO mission, and the ESA ENVISAT mission. Near real time products utilize the interim geophysical data records which are available 2 to 3 days after satellite overpass.

Technical Description of the Images: A time series of relative lake level variations for Lake Guri, Venezuela. The product has been derived using data from the ESA ENVISAT satellite radar altimeter. Raw results are display at the top, filtered or smoothed results to aid visualization are below. Accuracy is estimated to be ~10cm rms.

Application to Decision Making: Provision of global near-real time water level information for regions where gauge data are absent or data access is restricted.

Scientific Heritage: Project achievement is possible and based on the legacy of instrument development in NASA Radar altimetry (NASA/CNES Topex Poseidon), ocean science objectives and successful investigations such as the NASA Ocean Pathfinder Project, and USDA/FAS personnel reaching out to Jim Tucker of the Biospheric Sciences branch at GSFC on applications to inland waters, including lakes, reservoirs, rivers and wetlands.

References:

Birkett, C.M., Reynolds, C., Beckley, B and B. Doorn, From Research to Operations: The USDA Global Reservoir and Lake Monitor, Chapter 2 in 'Coastal Altimetry', eds. S. Vignudelli, A.G. Kostianoy, P. Cipollini and J. Benveniste, Springer Publications, ISBN 978-3-642-12795-3, 2010.

Birkett, C.M., Beckley, B., Investigating the Performance of the Jason-2/OSTM radar altimeter over Lakes and Reservoirs, Jason-2/OSTM Special Issue, Journal of Marine Geodesy, 33(1), pp.204-238, 2010.

Birkett, 'Lake Levels', in State of the Climate in 2009, Chapter 2. Global Climate, Section 3 Hydrological cycle, editors D.S. Arndt, M.O. Baringer and M.R.Johnson, Bulletin of the American Meteorological Society, 91(7), 38-39, 2010.

Hands-on Workshop for Water Resources Management in Latin America and the Caribbean

Ana Prados, University of Maryland Baltimore & NASA GSFC

Highlight – Local workshop helped build technical capacity to access and utilize NASA precipitation and snow products in Latin America and the Caribbean. Accomplished via a 2-day hands-on training, the workshop was conducted during the GEO Hydrological and Space network of Information for Latin American and the Caribbean (CIEHLYC), held in Cartagena, Colombia on November 28-December 2nd, 2011. Attendees analyzed Case Studies for the 2011 floods in Colombia and recent el Niño/Niña events. This was the first Water Resources Management training conducted by the Applied Remote Sensing Training Program. Workshop modules are publicly available at http://water.gsfc.nasa.gov in English and Spanish.

Relevance – This workshop met the need for more observational data in Latin America due to increased incidence of floods, particularly in Colombia. It also met the needs for monitoring climate driven decreases in snow, and its impact on water availability in Andean countries. End-users indicated that TRMM precipitation and NASA Flooding forecasts based on TRMM can help aid existing forecasting capabilities in Colombia. The workshop increased awareness of available NASA resources and its benefit for water resources applications, and built skills on image access and interpretation. Some attendees were previously unaware of NASA products and tools available for flooding monitoring applications.

Figure 1: Top: Course attendees from Belize, Brazil, Colombia, Chile, Jamaica, and the Center of Oceanographic and Hydrological Research at the Colombian Naval Academy in Cartagena, Colombia. There were 20 attendees who attended the 2-day NASA hand-on training.

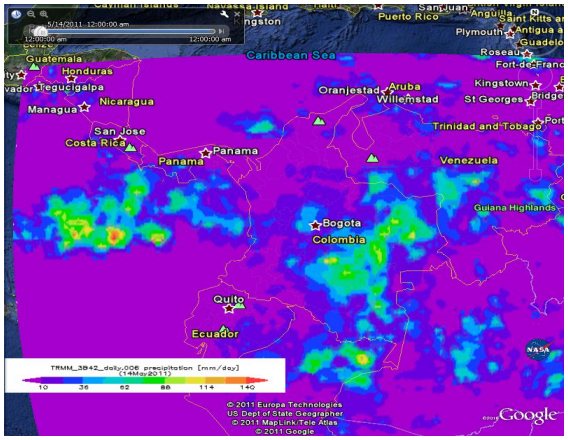

Figure 2: TRMM Precipitation rate image used during a workshop Case Study used by workshop attendees to analyze severe flooding in Colombia in 2011

ESD Applied Sciences Program

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Primary Partners:
GEOS/CIEHLYC

Project Summary: Provide NASA remote sensing technical workshops that build the skills to use NASA Earth Science imagery, tools and applied research, for water resources management applications.

Earth Science Products: TRMM rain rate, AIRS Cloud Fraction and Sea Surface Temperature, MODIS snow cover, and MERRA (model derived) winds and snow cover, used to analyze flooding events, climate variability, and snow cover changes in Latin America.

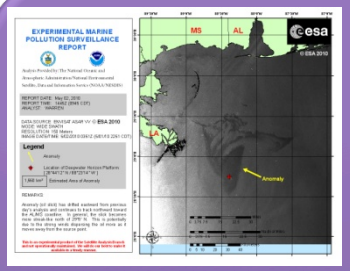
Technical Description of the Images: Photograph taken at the Almirante Padilla Naval Academy in Cartagena Colombia showing the attendees (20 in total) from the NASA hands-on workshop (Figure 1). TRMM precipitation rate from a severe flooding event in May 2011 in Colombia, used for one of the hands-on workshop Case Studies (Figure 2).
Application to Decision Making: Improved ability to monitor precipitation and assess the impacts of flooding in Colombia, particularly in regions where in-situ monitor data and flooding forecasts are currently absent.

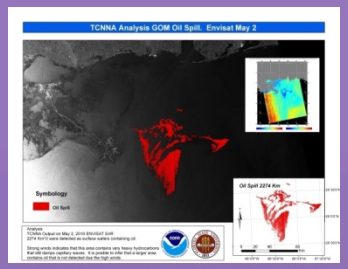
Capability building: Built skills on access and interpretation of NASA precipitation (TRMM) and cloud cover (AIRS) imagery, and visualization of changes in snow cover in the Andean countries in Latin America due to climate change using MODIS and MERRA model data. Also built awareness of the range of NASA products and tools available for precipitation and snow applications. In 2012, surveys will be sent to course attendees to measure changes in NASA data utilization as a result of the NASA hands-on workshop.
Scientific Heritage: N/A

References: Prados, Ana I., The NASA Applied Sciences Remote Sensing Training Program, presented at the GEO-CIEHLYC Water Cycle Capacity Building Workshop, Cartagena, Colombia, November 28-December 2, 2011.
Mehta, Amita, NASA Precipitation Products/TRMM, presented at the GEO-CIEHLYC Water Cycle Capacity Building Workshop, Cartagena, Colombia, November 28-December 2, 2011.

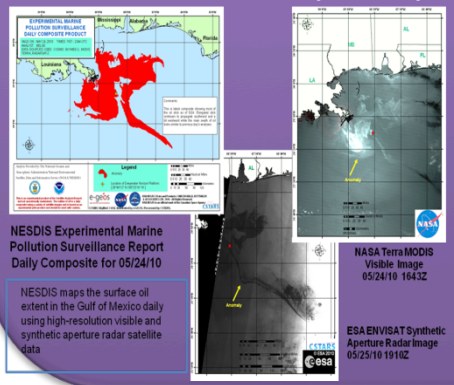
OIL SLICK DETECTION USING NASA ACTIVE AND PASSIVE SENSORS

Sonia C. Gallegos, William Pichel, Robert Arnone, and Yongiang Hu



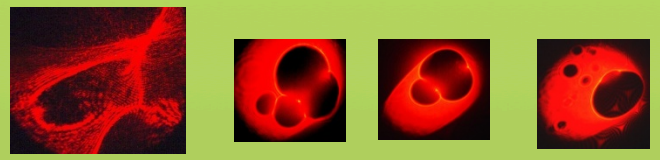


Transition of TCNNA (model) to NOAA/SAB operations.

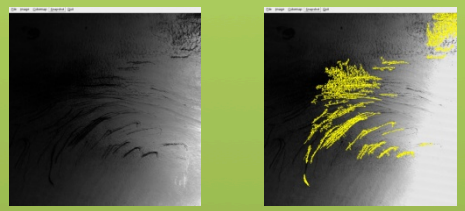


Development of experimental and operational products during DWH oil spill

Kinetics of oil film aging and dispersion by Corexit 9500



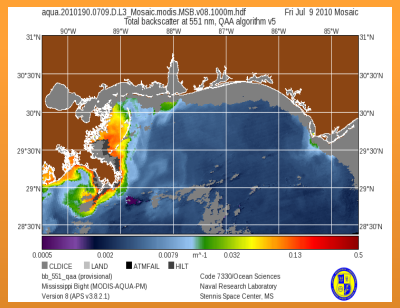
Published in Applied Optics 2011

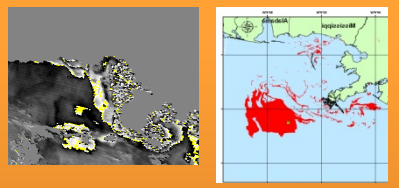


Automated detection of oil slicks in glint MODIS imagery .

Software completed

1 full transition into operations; 10 peer-reviewed publications, 8 presentations, 1 demonstration

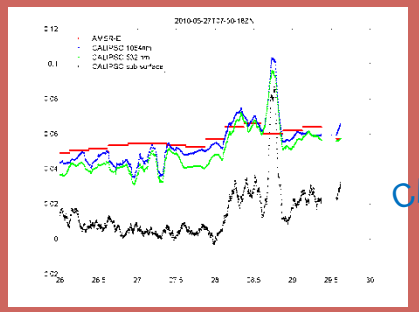




Publication in preparation

MODIS Backscattering coefficient products for oil detection

Oil Detection Capabilities of CALIOP Demonstration



Yes ! CALIOP can detect oil

Remote Sensing of the Environment publication 2012